3. In the upper regions these currents are deviated to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. Thus the equatorial current from the east becomes a current successively from southeast, south, southwest, and west, the counter-trade of the Northern Hemisphere, and successively a current from northeast, north, northwest, and west, the counter-trade of the Southern Hemisphere. These upper currents feed the tropical high pressure regions from the equatorial side. In the same manner the westerly currents of the temperate zones become above northwest and southwest, respectively, and feed the tropical maxima from the polar sides.

4. From these maxima there blow in the lower strata the trade winds from northeast and southeast toward the equator, from directions opposite to the southwest to west winds in the Northern Hemisphere and the northwest to west winds of the Southern Hemisphere.

5. From the polar regions observations are still not very numerous; from those cited above it is seen, however, that winds from the east are frequent at the surface of the earth above latitude 60° to 70°, but that generally winds from northwest to southwest blow above in the upper strata. This is probably explained by the frequent passage of barometric depressions which are not closed above on their polar sides. If, however, there exists a maximum to the north, winds from the east blow above also. Over Baffin Bay, whose waters are more or less open and surrounded by very cold countries, there exists, especially in winter, an almost stationary depression with winds from southeast to east in Greenland and from the north in Ellesmere Land.

6. The greater the elevation, the more constant from the west are the winds of the temperate zones, from which it is to be concluded that cyclones and anticyclones are phenomena that originate in the lower strata of the atmosphere.

7. Hence a direct upper current from the Equator to the poles does not exist, nor a lower current in the opposite direction from the poles to the Equator.

8. However, there is a slow exchange of air along the meridians, caused by continuous cyclonic and anticyclonic whirls in the temperate zones. Indeed each of these whirls carries air on the one side from south to north and on the other from north to south. Besides, as the air has an ascending movement in the cyclones and a descending one in the anticyclones, it is seen that the masses of air from different latitudes become gradually mixed.

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GENERAL CIRCULATION OF THE ATMOSPHERE.

By L. GANGOITI, S. J.

Translation and abstract of 8 folio pages from the report of 1917 of the Meteorological Observatory of Belen College, Habana.

The author discusses the theory of the trades and antitrades and presents data, principally observations of the direction and movement of high clouds to refute the existence of the anti-trades as set out by Dove and other modern writers.

He refers to observations made at Quito, latitude 0° 13′ south, in June, 1877, of volcanic smoke which rose to an altitude of 8,000 or 9,000 meters and was then carried in a westerly direction by an easterly current. Also he discusses 12 observations of the movement of smoke from Cotopaxi made in Ecuador in the immediate vicinity of the Equator in 1907 and 1908, which show directions as follows: Northwest 1, west or southwest 3, east 4, and southeast 4.

Volcanic ashes from the eruption of Coseguina (Nicaragua) in 1835 fell in Mexico to the northwestward, in Bogota to the southeastward, and in Jamaica to the northeastward, from which he draws the conclusion that there must have been high currents from different directions, i. e., that the southwest anti-trades were not continuous. Observations of smoke from Colima, latitude 19° 30′ 25″N., altitude 3960.9 meters, during 13 months scattered through a period of three years, show that during the period April to September the most frequent quadrant is the northwest; during November, December, and January, the southeast; in February, the southeast and southwest equally; while in March it is the southwest, the latter being the only month that shows a prevalence of the high currents having a direction the same as that attributed to the anti-trades.

Cirrus cloud observations made in Ecuador during 38 months in 1907, 1908, 1909, and 1910 show that by far the most frequent direction is the northeast (29 months), and next the northwest (7 months), while in two other months the number of observations of northeast and northwest currents was equal.

Cloud observations at Port of Spain, Trinidad, latitude 10° 35′ N., show that the cirrus move from the west from

November to May, and from the east from June to October, while the cirro-stratus come from the east during the period June to November and from the west during the remainder of the year. At Willemstadt, Curaçao, latitude 12° 10′ N., the cirrus move from the east in July and August. At Kingston, Jamaica, latitude 17° 58′ N., the direction is north-northeast in July and August and north in September. At San Juan, Porto Rico, latitude 18° 29′ N., three entire years of observations show southeast 18 months and east 12 months, with no indications of a seasonal variation. At Habana, latitude 23° 8′ 14″ N., for the period 1892–1902, the cloud movement is as follows:

	Cirrus.	Cirro-stratus.
January	S. 81° W.	S. 79° W.
February	S. 83° W.	S. 80° W.
March	N. 88° W.	S. 89° W.
April	N. 89° W.	S. 89° W.
May	N. 83° W.	S. 84° W.
June	N. 49° W.	N. 84° W.
July	N. 28° E.	N. 52° E.
August	N. 48° E.	N. 54° E.
September	N. 27° E.	N. 89° E.
October	N. 87° W.	S. 81° W.
November	S. 77° W.	S. 72° W.
December	S. 80° W.	S. 73° W.

From this table it will be seen that the cirrus move from the first quadrant during July, August, and September, from the third quadrant in November, December, January, and February, and from the fourth quadrant in March, April, May, June, and October.

From the observations of the Antilles before referred to the author concludes that there is nothing that can give rise to the slightest suspicion of the existence of a high current which is constant, or nearly so, nor do they bear out the theory that the most elevated clouds move from the southwest toward the northeast between the equator and the tropics.

The writer next examines eight months of observations scattered over the years 1882 and 1883 of high clouds at Funchal (Madeira), latitude 32° 38′ N., which show most frequent directions as follows: North 4, north-northeast 1, northeast 1, northwest 2.

At Montpellier, France, latitude 43° 37′ N., 18 months of observations of cirrus and cirro-stratus clouds made during 1881 and 1882 show most frequent movement from various directions. Observations at Moncalieri, latitude 45° N., for the years 1878 and 1879 show a prevalence of high currents from the northeast and north in practically every month.

He also quotes extracts from the Indian Memoirs, Volume XV, as follows:

Madras: Latitude 13° 4′ for the period 1896–1900. Observations show that in February the prevailing direction is S. 18° E., in May, S. 69° E., and in June, S. 83° E. For the same station for a period of six years the following is given:

	Cirrus.	Cirro-stratus.
August	N. 89° E.	N. 66° E.
September	S. 84° E.	N. 48° E.
October	S. 57° E.	S. 79° E.
November	S. 35° E.	

Visagapatan, latitude 17° 42′ (1897–98):

	Cirrus.	Cirro-stratus.
August	NE.	N. 71° E.
September	S. 56° E.	N. 45° E.
October	S. 64° E.	S. 76° E.
November	S. 24° E.	S. 34° E.
December	S. 28° E.	S. 8° E.

Allahabad, latitude 25° 26′ (1897–1900):

	Cirrus.
July	N. 78° E.
August	N. 7° E.

The cirrus at Allahabad have exactly the same direction in December, January, and May, and the cirro-stratus in March, as these at Habana. In the other months, with the exception of July and September, the angular differences are unimportant.

At Manila, latitude 14° 34′ 42″, for the period 1890–1898, observations of high clouds give results as follows:

January	S. 6° 00′ E.	July	N. 76° 28′ E.
February	S. 11° 20′ E.	August	N. 83° 53′ E.
March	S. 17° 29′ E.	September	N. 62° 58′ E.
April	S. 82° 54′ W.	October	S. 47° 25′ E.
May	N. 73° 29′ E.	November	S. 68° 44′ E.
June	N. 75° 23′ E.	December	S. 55° 29′ E.

Those of the second [fourth?] quadrant predominate from October to March; those of the third quadrant in April, and those of the first quadrant from May to September. In July, August, and September the cirrus at Habana also predominate in the first quadrant.

An inspection of a number of Japanese stations shows that from June to September the movement of the cirrus for the most part is from a point between north and east.

In conclusion, the author states that the data presented indicate that there are variations in the direction of the high currents in the region of the cirrus and cirro-stratus, the fundamental cause of which is found in the location and movements of the centers of maximum and minimum pressure and that the change of direction in these currents is very similar to that of the atmospheric winds as determined by the barometric gradient. He also observes that the cirrus and cirro-stratus clouds which accompany migratory cyclones form angles with the direction of movement of the latter, dependent on the distance and direction from their centers.